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AUTHORS' ABSTRACTS.

U. S. Geologic Atlas. Folio 11, Jackson, California, 1894.

This folio consists of two pages of text descriptive of the Gold Belt, concluding with a generalized section of the formations of the Gold Belt, four pages of text descriptive of the Jackson area, signed by H. W. Turner, geologist, and G. F. Becker, geologist in charge; a topographic map of the Jackson tract (scale 1:125000), a sheet showing the areal geology, and a third of structure sections.

The area covered by the folio embraces a portion of the foothills of the Sierra Nevada, chiefly in the counties of Amador and Calaveras, California. The area is drained by the Mokelumne and Calaveras rivers. The region is one of great economic importance, and comprises a portion of the rich belt of gold-quartz mines known as the Mother Lode. One of these mines, the Utica, at Angel's Camp, is said to be paying one million dollars yearly at the present time.

There are two distinct series of formations represented in this area. The Calaveras and Mariposa formation, of sedimentary origin, and the associated igneous rocks form an older, highly disturbed series, on which a later series rests with a marked unconformity. This later series represents the Tertiary and Pleistocene periods.

The Calaveras formation, of Carboniferous age, is composed of slates, quartzite, mica-schists, and limestone lenses, and contains frequent gold-quartz veins. The Mariposa formation, of Jurassic age, is largely made up of clay-slate. There are two main belts of this formation, and in the eastern one occur many of the gold-quartz mines of the Mother Lode.

The igneous rocks associated with the Calaveras and Mariposa formations are of considerable variety, but only three form considerable areas. These are serpentine, granite, and the porphyrites (old andesites) and their tuffs. The serpentine is undoubtedly an altered form of basic igneous rocks (pyroxenite and pridotite), and is intrusive. The granite is likewise intrusive, cutting through all the older rocks, except the Mariposa formation, and there is little doubt that it is later than this formation also, and in adjoining districts it invades the Mariposa slates as well. The porphyrites are largely altered forms of surface lavas and tuffs, resembling andesite and in part basalt, and these rocks have been folded and compressed along with the sediments of the Calaveras and Mariposa formations. The areas called amphibolite-schist on the geological map are chiefly metamorphic forms of these porphyrite-tuffs.

The formation of the later series, resting on these older rocks, that deserves most attention is called Auriferous gravel formation. These gravels which are found chiefly on the ridge-tops, were deposited in Neocene time by rivers. These old streams, as may be seen by inspecting the map, united into one trunk a little to the north of the Bear Mountains, and there found an outlet into the gulf that then filled the San Joaquin Valley. At many localities these old-river gravels have been profitably mined for gold. Forming a capping to the gravels are usually beds of volcanic material, chiefly andesite and rhyolite.

The Calaveras formation is of economic importance as containing frequent gold-quartz veins and lenses of limestone. Most of the latter are noted on the geological map.

The Mariposa formation affords a good roofing slate, but is chiefly remarkable as containing, in Amador county and in the north portion of Calaveras county, the quartz veins of the Mother Lode.

The amphibolite-schist belts contain copper deposits and gold-quartz veins. In the southern part of Calaveras county, at Angel's Camp, the Mother Lode lies to the east of the Mariposa slates and intersects a belt of amphibolite-schist.

In the granite of the West Point area are numerous gold-quartz veins, the ores of which contain a larger per cent. of sulphurets than the ores of the Mother Lode mines, and such ores are called base.

The serpentine areas contain chrome-iron deposits at numerous points.

The tuffs overlying the gravels at Mokelumne Hill, Valley Springs, and other points, have been found to make good building stone. Sandstone quarries are worked in the foothills in beds of Tertiary age, and the deposits of the same age near Ione afford large quantities of clay for pottery, and of coal.

U. S. Geologic Atlas, Folio 12, Estillville, Kentucky; Virginia; Tennessee, 1894.

This folio consists of five pages of text by M. R. Campbell, geologist, a topographic map of the district (scale 1:125,000), a sheet showing the areal geology, another showing the economic geology, a third of structure sections, and a fourth giving a columnar section north of Clinch River and another south of that river.

The territory represented by the folio is located principally in southwestern Virginia, though the southern portion extends into Tennessee and the northwestern portion into Kentucky. Its area is 957 square miles, four-fifths of which is in the Appalachian Valley and one-fifth in the Cumberland coal basin.

The surface features are quite varied. In the Appalachian valley they consist of a succession of narrow ridges separated by equally narrow valleys, trending in a northeast and southwest direction. In the coal basin the ridges are less regular, but higher, reaching in two cases an elevation of over 4100 feet above the sea level.

The region is almost entirely within the drainage basin of the Tennessee River. The principal tributaries of this stream are Holston, Clinch, and Powell Rivers, each of which is a stream of considerable importance. The Kentucky portion of the territory is drained by the headwaters of the Cumberland River.

The geologic structure of the region is complicated. In the Appalachian Valley the rocks have been squeezed, in a northwest and southeast direction, until they have been forced into great folds. These are generally overturned toward the northwest, and have in many cases been compressed to such an extent that they have broken, allowing one limb of the fold to be thrust over the other. These faults are of frequent occurrence in this region. Sixteen or seventeen can be counted on the geologic map. In the coal basin the folding is less severe, and the result is a broad basin in which dips are prevailingly light, and in many places the rocks are horizontal.

The intense folding of the strata has brought to the surface all of the geologic formations from the Carboniferous to the Cambrian. On lithologic grounds these are divided into twenty-two separate and distinct formations. As a result of the original folding and subsequent erosion, these formations show at the surface in long, narrow outcrops of limestone, shale, or sandstone, which, in the various folds, are repeated over and over again. It is this repetition of the hard beds that gives rise to the numerous ridges which are such conspicuous features of Appalachian topography. In the coal basin the rocks are nearly horizontal, and hence they show in outcrop around the flanks of the mountains, or irregularly over the less rugged portions.

The mineral resources of this region are important, though at present but slightly developed. A belt of marble, varying considerably in composition and appearance, outcrops along the northern side of Clinch Mountain. Iron ore occurs in many parts of this territory, both in the form of limonite and in that of hematite. Red fossil ore is found in the Rockwood formation in the northern part of the region, and it is mined on Wallen Ridge south of Big Stone Gap. Coal is the principal mineral resource of this territory. It occurs in the structural basin north of Stone Mountain, and sparingly in the great arch of Powell Mountain east of High Knob. The coal-bearing rocks are approximately 5000 feet in thickness, and include many seams of workable coal. In the vicinity of Big Stone Gap the Imboden seam is the most important. It has been traced over a large area on the Virginia side of the basin, where it varies from 3 to 16 feet in thickness. On this side there are a number of other seams of good quality, ranging from 3 to 7 feet in thickness, which could be easily worked. The Kentucky portion has also many workable seams, but at present, owing to lack of transportation, no mining has been done on a commercial scale.

U. S. Geologic Atlas, Folio 13, Fredericksburg, Virginia; Maryland, 1894.

This folio consists of five and one-fourth pages of text, signed by N. H. Darton, geologist, and M. J. McGee, geologist in charge; a topographic map of the district (scale 1 : 125,000), and a sheet showing the areal geology.

The map represents an area of approximately 1000 square miles of the Coastal Plain region of northeastern Virginia and the southwestern corner of Charles county, Maryland. It includes, in Virginia, King George and the greater part of Caroline and Stafford counties, and adjoining portions of Spottsylvania, Essex, and Westmoreland counties. The city of Fredericksburg is near the center of the western margin of the area. The Potomac River crosses the northeastern corner of the area, and the Rappahannock River extends diagonally across its center on a northwest and southeast line. The headwaters of the Mattapony River are in its southwestern corner. Along these river valleys there are wide, low terraces capped by the Columbia formation, of Pleistocene age. The intervening areas are plateau remnants capped by Lafayette deposits, of supposed Pliocene age. The underlying formations are the Potomac, Pamunkey, and Chesapeake, which lie on an east-sloping floor of crystalline rocks. This floor rises to the surface and constitutes hills of considerable height in the northwestern corner of the tract; eastward it is deeply buried under the Mesozoic and Tertiary sediments. The Potomac formation, which is the basal member of these sediments, consists of a heterogeneous series of sands and sandstones with intercalated clays. Much of the sand is arkosic, and consists of detritus of crystalline rocks. The Pamunkey formation, which overlies the Potomac unconformably, is the representative of the Eocene in this region. It consists in greater part of glauconitic marls. These marls are important fertilizers, and in some portions of the region have been used with excellent results. They are overlain unconformably by the Chesapeake formation, which is of Miocene age. It is characterized by fine sands, marls, and clays, portions of which consist largely of diatom remains. It is the same series that extends to Richmond, where its diatomaceous character was discovered many years ago, and to the northward through Maryland. It thickens rapidly eastward, and is nearly 1000 feet thick in the lower Chesapeake Bay district.

The crystalline rocks consist mainly of granites and gneiss and an infolded bed of slates, to which the name Quantico slates has been given. They are not of value for roofing slates, so far as is now known. They appear to be a continuation of the slates in the belts west of Richmond, in which lower Silurian fossils were discovered some time ago, but no fossils have been found in the area of the Fredericksburg sheet.

U. S. Geologic Atlas, Folio 14, Staunton, Virginia; West Virginia, 1894.

This folio consists of four pages of text, signed by N. H. Darton, geologist, and closing with a columnar section of the area; a topographic map (scale 1 : 125,000), a sheet showing the areal geology of the district, another showing the economic geology, and a third exhibiting structure sections.

The area represented is about 1000 square miles of central Appalachian Virginia. It comprises central and western Augusta county and portions of several adjacent counties. Staunton lies near the center of the eastern margin of the tract. About a third of the area is in the Great Valley of Virginia, and the remainder stretches halfway across to the Allegheny.

The geologic formations comprise members from the Shenandoah limestones of the Great Valley to the Pocono sandstones of Lower Carboniferous age. There are also some small dikes of diabase in the northwestern corner of the area. The region is one in which relatively gentle folds predominate. There is an overthrust fault which extends along the western side of the Great Valley for some distance, and several other faults traverse the Shenandoah limestone.

The geologic classification does not differ materially from that outlined by W. B. Rogers, but geographic names have been applied to the formations. The name Shenandoah limestone has been selected for the great series of limestones of the valley. This series comprises several subdivisions, but they merge so gradually in the Staunton region that no attempt has been made to differentiate them on the map. The upper member contains a Trenton fauna, and it is thought that the basal beds of the series extends into the Cambrian, although no fossils have been discovered in them. Next, there is the representantive of the Utica and Hudson shales, which has been designated the Martinsburg shale. It is overlain by the Massanutten sandstones, which comprise the Oneida and Medina, in terms of the New York series. Next, there are the Rockwood formation and the Lewistown limestone, which include the formations between the Clinton and Lower Helderberg. The Oriskany and associated sediments are here represented by a stratigraphic unit to which the name Monterey sandstone has been given. The great series of Devonian strata lying above the Monterey has been divided into the Romney shale, Jennings formation, and Hampshire formation. As they are not sharply separated from each other the patterns by which they are represented on the map are merged over a narrow zone along their boundaries. Only a portion of the Pocono formation is included in the stratigraphic column in the region.

The principal economic resources are iron ores, which lie on a local unconformity between the Monterey sandstone and the Romney shale, and limestone for flux. Some of the limestones are suitable for marbles, and at many points lime is burned for local use. There are several thin, irregular beds of coal in the Pocono sandstone, but they are not of economic importance. Brick and pottery clays in the Great Valley complete the list of economic resources.

U. S. Geologic Atlas, Folio 15, Lassen Peak, California, 1895.

This folio consists of two pages of text by J. S. Diller, geologist, descriptive of the Lassen Peak district, supplemented by two pages, with illustrations (nine figures), devoted to recent volcanic activity; a topographic map of the district, a sheet showing the areal geology, and another showing the economic geology.

The Lassen Peak district is situated in northern California, between the Sacramento Valley and the Great Basin, and adjoins the northern end of the Sierra Nevada. It is bounded by the 121st and 122d meridians and the 40th and 41st parallels, and contains an area of 3634.4 square miles.

Within the district there are three distinct topographic features. Beginning at the west, it includes (1) a small portion of the eastern border of the Sacramento Valley; (2) the Lassen Peak volcanic ridge; and (3) upon the east a portion of the Great Basin platform.

Twenty-two geological formations are shown upon the map. Thirteen of these were deposited by water as sedimentary rocks. The remaining nine are of igneous origin, and were erupted from the interior of the earth in a molten condition. Some of the sedimentary rocks, especially the younger ones, have not been materially changed since they were deposited; but others, such as the auriferous slates, have been greatly altered or metamorphosed, and contain veins of quartz and metalliferous deposits.

By far the most abundant rocks of the Lassen Peak district are those of igneous origin. The numerous volcanoes of the district have furnished a great variety of such rocks.

Beds of unaltered stratified rocks, none of which are older than the Cretaceous, are still nearly horizontal; although uplifted, they have not been compressed enough to produce folds. On the other hand, the auriferous slates have been thrown into a series of anticlines and synclines, and so greatly compressed as not only to close the folds, leaving the strata in many cases approximately vertical, but also to break and displace them along a series of thrust faults during the earth movements by which the mountains were produced.

Upon the economic map special attention is called to the distribution of auriferous slates, in which alone there is any probability of discovering valuable deposits of precious metals. These rocks are exposed in the southeastern and northwestern portions of the area mapped, and extend through under the lavas of the Lassen Peak district, from the Sierra Nevada to the Klamath Mountains of the Coast Range. The broad stretch of unaltered lavas about Lassen Peak does not contain any appreciable amount of precious metals, and may be wholly neglected by the prospector.

Among the auriferous slates seven formations have been distinguished, ranging in age from the Silurian to the Jurassic, inclusive. Of these the Cedar formation, of Triassic age, has been the most productive. By its disintegration it has furnished the gold for the placer mines of Indian Creek below Shoo Fly, of Soda Creek, Rush Creek, the north fork of Feather River, and Dutch Hill. The Savercool mine, by the north fork of Feather River, is on this belt, and active prospecting is going on at a number of points. Numerous copper deposits have been discovered in the Pit River region.

Intermingled with the auriferous slates there are eruptive rocks, such as diabase, porphyrite, peridotite, and diorite, which have much to do in determining the distribution of certain classes of ore bodies. The areas of eruptive rocks have been outlined, and it has been found that the most promising prospects of that region are located near the borders of these eruptive masses. The ore deposits may be in the auriferous slates or the eruptive rock, but in either case they are not far from the contact.

Traces of coal have been discovered in the Chico and Ione formations, but no deposits of considerable value are yet known in the region of Lassen Peak. The Tuscan tuff has furnished some excellent material for chimneys, hearths, and water coolers. The large deposit of diatom earth on Pit River, having a thickness of over one hundred feet and a length of several miles, is of economic importance for polishing, packing, making explosives, and other purposes.

U. S. Geologic Atlas, Folio 17, Marysville, California, 1895.

This folio consists of two pages of text descriptive of the Marysville tract, signed by Waldemar Lindgren and H. W. Turner, geologists, and G. F. Becker, geologist in charge; a topographic map (scale 1 : 125,000) of the tract, a sheet showing the areal geology, another showing the economic geology, and a third exhibiting structure sections.

Topography.—The Marysville tract includes the territory between the meridians 121° 20′ and 122° and the parallels 39° and 39° 30′, and contains 925 square miles. The tract is located near the center of the Sacramento Valley. The larger part of it is occupied by the alluvial plains of the Sacramento and Feather Rivers. The extreme northeastern corner includes the first rolling foothills of the Sierra Nevada. In the center of the tract rises the isolated mountain group of the Marysville Buttes.

General geology.—The alluvial lands consist of sands, clays, and gravels, deposited by the shifting currents of the streams. The foothill region of the northeastern corner is principally occupied by the gravels of Pleistocene and Neocene age. The area composed of the bedrock series of the Sierra Nevada is small and consists of diabase and porphyrite. The mountain group of the Marysville Buttes is an extinct volcano of probably late Neocene age, the internal structure of which is to a certain extent laid bare by erosion. The eruptive rocks of the buttes are andesites and rhyolites. In describing the structure of the group three parts may be distinguished: First, the central core of massive andesite and rhyolite; second, the upturned sedimentary rocks surrounding the massive core, evidently brought into their present position by the force of the ascending lavas; the sediments are of Eocene and Neocene age; third, the external ring of tuffs and breccias. The feature of greatest interest in connection with the Marysville Buttes is doubtless the presence of upturned sediments around the central core.

Economic geology.—The shore gravels in the northeastern corner contain some gold and have been washed superficially. Somewhat auriferous gravels are also found in the upturned sediments of the Marysville Buttes. Coal and natural gas have been found in small amounts in the Marysville Buttes.

Iowa Geological Survey. Vol. IV., Third Annual Report, 1894, with accompanying papers. SAMUEL CALVIN, State Geologist, Des Moines, 1895.

The fourth volume of the reports of the Iowa Geological Survey has been issued and distributed. So far as size and general make-up are concerned this volume is uniform with those previously issued. About fifteen pages are devoted to Administrative Reports and the remainder of the volume, which contains 467 pages altogether, is devoted to county geology. The geologists of Iowa have adopted the county as the areal unit for final geologic mapping and report. "The boundaries of counties are definitely located and generally known. The county is one of the organic units of civil government. Its inhabitants are bound together by common purposes, and have a common pride in its resources and in whatever promotes its welfare. Definite information regarding the resources of his county as such has more interest to the ordinary intelligent citizen, ... than a report on an area embracing probably parts of several counties, though that area lend itself more naturally to scientific investigation, because limited by natural geographic features or distinguished by some peculiarities of geologic structure."

The first work of the Iowa geologists was necessarily in the nature of a general reconnoissance of the entire field. That work done, the energies of the Survey will hereafter be chiefly devoted to areal geology, the county in each case being the areal unit. The present volume contains reports on six counties: Allamakee, Linn, Van Buren, Keokuk, Mahaska and Montgomery. Reports on two counties, Lee and Des Moines, were included in Volume III. Geological maps of the several counties are published on a scale of one-half inch to the mile.

Geology of Allamakee County.—The volume proper begins with the geology of Allamakee county, by Samuel Calvin. This county is somewhat unique among the counties of Iowa in that it lies almost wholly within the *Driftless Area.* Its topography therefore is such as would be produced by the chemical and mechanical effects of destructive agents acting, for a somewhat limited period, on beds of limestones, sandstones and shales in a region standing from 600 to 700 feet above base level. The main streams have cut their channels to base level, and the dividing ridges have their sides deeply scarred and gashed by multitude of divaricating erosion channels indicative of greater or less progress in the work of bringing down the ridges to the same level. The tops of the ridges are regarded as co-incident with an old peneplain, and the difference in altitude between this peneplain and the base level of the present streams measures the amount of elevation that the region has suffered since the original peneplain was completed.

The geological formations of Allamakee county include the Saint Croix sandstones of Cambrian age, and the Oneota limestone, Saint Peter sandstone and Trenton and Galena limestones of the Lower Silurian. Overlying the indurated rocks are beds of residual clays and sands, while over nearly the whole county there is in addition a thin mantle of loess. A few erratic bowlders, probably overwash from the margin of the drift, are scattered over the southwestern part of the county. The report is embellished with a number of engravings that are chiefly illustrative of the topographic features of the county. The economic products of the county justly receive a fair share of attention.

Geology of Linn County.—By WILLIAM HARMON NORTON. This paper contains several paragraphs of general interest. The Devonian series in the county is divided into the Cedar Valley stage and the Wapsipinicon stage. The latter embraces the Upper Davenport beds, equivalent to the Gyroceras beds of Calvin, and to the Upper Helderberg of Hall, and the Carboniferous of Barris; the Lower Davenport beds not before delimited; the Independence Shales described for the first time in natural sections, and a new basal terrane termed the Otis beds, whose characteristic fossil is *Spirifer Subumbonus*, Hall. Above the Le Claire, the highest member of the Upper Silurian hitherto recognized, were found two new formations, transition beds to the Devonian and named the Bertram and Coggan.

Of special interest to glacialists are the sections and maps showing the form and structure of the unique glacial hills of this region, the Paha. They are treated as loess-capped drumloid accretions of till.

Geology of Van Buren County.—By C. H. GORDON. Van Buren county lies on the southern border of the state with one county (Lee) lying between it and the Mississippi River. The main drainage is effected by the Des Moines River which cuts it diagonally from the northwest to the southeast. The surface consisted originally of a broad level plain having a gradual slope toward the southeast.

The indurated rocks belong entirely to the Carboniferous formations, including the Burlington, Keokuk, Saint Louis and Lower Coal Measure stages. The Burlington is represented by the upper chert beds, to which the name Montrose cherts is here given. The stratigraphy of the region is described in considerable detail, and errors of previous writers corrected. Some of the points of interest brought out in the paper are the following: a revision of the classification of the Keokuk and Saint Louis formation, and the plane of separation between these more satisfactorily defined (See Journal of Geology, Vol. III, No. 3, 1895); the origin of the ox-bow bend of the Des Moines (a topographic map of the area is given showing terraces up to 145 feet above the river); the erosion unconformity between the Lower Carboniferous and the Coal Measures.

Geology of Keokuk and Mahaska Counties.—By H. FOSTER BAIN. These two adjoining counties lie in the southeast central portion of the state well to the eastern border of the coal field. In general geological features they are essentially similar. The indurated rocks include the Augusta and Saint Louis limestones and the Des Moines Coal Measures. The first two are, for this district, conformable. The erosion unconformity between the Saint Louis and the Des Moines is strikingly exemplified in Mahaska county at Corrier's Mill and Raven Cliff, and in Keokuk county at What Cheer. The Saint Louis in its full section shows from the top downwards (*a*) Pella beds, fossiliferous marls and bedded limestones, (*b*) Verdi beds irregularly alternating limestones and sandstones; and (*c*) Springvale beds, blue shales and earthy magnesian limestones. The Des Moines beds are made up largely of shales, with certain heavy sandstones and at least two coal horizons of which the lower is widespread and well opened up, and the upper is confined to a small portion of the Muchakinock Valley. The two counties are important coal producers, their aggregate tonnage for the year 1893 being 1,363,880 tons. The sandstones of the Coal Measures seem to mark local differences in sedimentation rather than a general horizon. There is evidence of some erosion during Coal Measure time. A series of slight parallel anticlinals cross the county from northeast to southwest.

The drift covers both counties in a sheet of very irregular thickness. It includes blue and yellow tills, local gravel and sand deposits, and an overlying silt or loess-like bed. The latter reaches no great thickness, but is an important source of material for clay-working industries, the total value of whose products for the year 1893 was $120,312. No distinct evidence of a well-marked forest bed is found and the correlation of the drift with that of other portions of the state is not attempted. Glacial striæ being S. 42° E., and a later set bearing S. 70° E. (magnetic), are found near Eddyville. The reports are illustrated by figures, half tones, cross sections and maps. On the map of Keokuk county a small area in Section 7 of Liberty Township, which the text shows to be Coal Measures, is by mistake colored as Saint Louis.

Geology of Montgomery County. — By E. H. LONSDALE. The exposed geological formations of Montgomery county represent three systems, the Pleistocene, the Cretaceous, and the Carboniferous. Alluvium, loess and till make up the Pleistocene, and the combined thickness of these three deposits amounts to nearly 100 feet. The Cretaceous, which consists for the most part of friable grits, constitutes the southern extremity of the formation in Iowa. Although present as outliers, the maximum thickness of the deposit is as much as 115 feet. It is possible to consider these soft sandstones, with the associated clay shales and conglomerates of the same age, as Dakota—the Nishnabotna of White.

The Carboniferous is represented by only the Upper Coal Measures which here has a thickness of approximately 1500 feet; while the entire Upper Carboniferous is found to be about 2000 feet thick. To a depth of several hundred feet the Upper Coal Measures is made up almost exclusively of argillaceous shales and hard limestones. Occasional bituminous seams are prevalent, but heavy veins of coal are certainly not present within accessible depths and deep borings indicate that none occur even to the base of the Upper Carboniferous.

The district is supplied with various materials of great economic value. The eighteen-inch seam of coal found near the drainage level in the northwestern quarter of the county is being quite extensively mined. The clays from two of the geological horizons are being used in the manufacture of various marketable products. The limestone ledges are being quarried at several points and utilized as building-stone, but the rock is also suitable for lime-making. There is also an abundance of less important yet useful substances. The fertility of the loess soil is probably not inferior to that of any other locality in the state.

How Old is the Mississippi? By FRANCIS M. FULTZ. Proc. Iowa Acad. Sci., 1894. Vol. II., p. 39. Des Moines, 1895.

The evidence set forth goes to show that the present Mississippi drainage system existed as early as the beginning of the Upper Burlington epoch; and that, although interrupted by frequent and perhaps prolonged submergences, it nevertheless still remains practically the same.

Glacial Markings in Southeastern Iowa. By FRANCIS M. FULTZ. Proc. Iowa Acad. Sci., 1894. Des Moines, 1895. Pp. 213–217.

Recent discoveries of glacial scorings in southeastern Iowa are reported as follows: Near Kingston, in the northern part of Des Moines county, two patches within about half a mile of each other. The first presents a perfectly level surface, over one hundred feet in length and from ten to twenty-five feet wide. The floor is covered with striations and grooves, all finely preserved. Four different sets can be easily determined. The grooves are straight and parallel; those from the latest series being fully an inch deep, while those from the earlier one are nearly obliterated. The trends given in the order of apparent age are as follows: 1. S. 30° 15′ E. 2. S. 64° E. 3. S. 60° 30′ E. 4. S. 72° 15′ E. Corrected for magnetic deviation. Aside from the direction of the striæ, all evidence points to a southeasterly flow of the ice sheet.

The second Kingston exposure lies on the brow of the bluff, facing the Mississippi flood plain, and extends for some distance down the face, descending at an angle of about 30°. There is but one set of markings, the trend being approximately 72° east of South. The bluff faces nearly due east.

In the Loftus quarry, four miles west of the city of Burlington, a large area was uncovered, showing both surface and lateral erosion. There was but one series of striæ, the direction being S. 75° E. The lateral erosion very strongly indicated the direction of ice flow to have been toward the Southeast.

Two other patches of scorings, about four miles northwest of Burlington, and located not more than forty rods apart, showed widely different trends. One was S. 33° E.; the other S. 73° E. Both surfaces were too badly weathered to furnish good corroborative evidence of direction of ice flow.

All the scorings above given are on the hard, compact limestone of the Upper Burlington formation, and are situated on or but a few miles back from the brow of the bluff that borders the old flood plain of the Mississippi.

Glacial markings previously reported from the vicinity of Burlington are as follows: By White, S. 15° E.; by Keyes, S. 63° E.; by Leverett, S. 65° E.

The Erosive Action of Ice. By G. E. CULVER. Trans. Wis. Acad. Sci., Vol. X., 1895.

This paper reviews briefly much of the literature relating to ice action, from the time of Ramsay to the present, and records some personal field observations bearing on the subject.

The author concludes that the erosive power of ice has been exaggerated in the past; that its transporting power has not been clearly discriminated from its eroding power; that it probably did not make rock basins, much less valleys; that in general its effect was to cut down prominences and fill depressions, and thus to lessen rather than to strengthen relief. He regards the drift as largely composed of material furnished by preglacial decay of northern rock. With this was mingled such fresh material as the ice could break from projecting points, and tear or wear from its bed.

Crystalline Limestones, Ophicalcites and Associated Schists of the Eastern Adirondacks. By J. F. KEMP. Bull. Geol. Soc. of Amer., VI., 241–262, 1895.

As study of the crystalline rocks in the eastern Adirondacks has progressed, it has become evident that in the gneissoid rocks on all sides of the Norian intrusions of anorthosites and gabbros, and extending well up between their ridges, crystalline, graphitic limestones, ophicalcites, and associated black hornblendic schists are met. Interlaminated with these are feldspathic gneisses, and occasionally graphitic quartz-schist, rich in sillimanite. The paper gives geological sections at Port Henry, and in western Moriah township, to show these relations. A most peculiar exposure in the Keene Valley, and well within the great anorthosite ridges, is also described, together with its intruded rocks — which are very similar to the Saxon granulites. In conclusion, the author briefly summarizes his conception of the rocks as a metamorphosed series of impure calcareous sediments.

The Stratigraphy of the Kansas Coal Measures; Division of Kansas Coal Measures; The Coal Fields of Kansas: By ERASMUS HAWORTH. *Kan. Univ. Quart.*, Vol. III., April 1, 1895, pp. 271-309, with two plates.

The articles with the above titles are summaries gleaned from chapters already prepared for Volume I. of the University Geological Survey of Kansas, which it is hoped will be completed during the year. Under the first heading is given a general description of the principal limestones and shale beds from the base of the Coal Measures to the Cottonwood Falls limestone, a vertical distance of 2500 feet or more. At the base of the column lie the heavy Cherokee shales, which are the principal coal-bearing shales of the state. Above these are successive limestones and shales, the whole aggregating a total thickness of 2750 feet. But the author states (p. 272) that probably no one place could be found where the thickness would be quite so much.

Plate XX. represents this column. Plate XXI. is a semi-perspective map of the east end of the state, on which is shown outcroppings of the principal limestone formations.

The author divides the Kansas Coal Measures, in the second article, into two divisions, the Upper and the Lower, with the top of the Pleasanton shales serving for the division line. In the last article, the geologic and geographic position of each of the principal coal beds is given, with tables of analyses of the coals by Professor Bailey, and of the steam heating properties by Professor Blake.

Annual Report of the State Geologist of New Jersey, for 1894. Part I. Surface Geology: 149 pp. and 4 plates. By ROLLIN D. SALISBURY.

The titles of the several sections of the report are as follows: Sec. I. General Outline Sketch of the Drift Deposits of New Jersey North of the Moraine; Sec. II. The Glacial Striæ of New Jersey (with map); Sec. III. Changes in Drainage Effected by the Drift; Sec. IV. Postglacial Changes in Drift Area; Sec. V. Beacon Hill Formation; Sec. VI. Pensauken Formation; Sec. VII. Jamesburg Formation; Sec. VIII. Post-Jamesburg Formations; Sec. IX. Road Material; Sec. X. Explanation of Map of Surface Formations of Sheet 6, New Jersey Atlas.

In Section I., in addition to the matters implied in the title, details and sections (Pl. I) are given, showing the conditions under which the stratified drift of the valleys was deposited, and many details concerning the effect of stagnant ice on drift accumulations. In Section III., it is represented that while the ice effected many minor changes in the drainage in New Jersey, there were few of great extent outside the basin of the Passaic, and possibly the Raritan. The lakes of the state are classified with reference to the origin of their basins. In Section IV., emphasis is laid upon the trivial amount of erosion suffered by the northern part of the state since the drift was deposited. In Section V., the conclusion is reached that the Beacon Hill formation is of Miocene age; in Section VI., that the Pensauken is the equivalent of the Lafayette; and in Section VII., that the

Jamesburg formation corresponds with the Columbia. A twofold division of the Jamesburg is recognized, corresponding, in all probability, with the "high level" and "low level" Columbia of the south, as described by McGee and Darton. Sections (Pl. III.) are given showing the topographic and stratigraphic relation of the formations referred to in Sections V.–VIII. The report is accompanied by a map of the surface formations of the area covered by Sheet 6 (Basin of the Passaic and surroundings) of the New Jersey atlas, and Section X. is a brief statement intended to assist in an understanding of the map.

The Stone Industry in 1894. By WM. C. DAY. Sixteenth Ann. Report U. S. Geol. Survey, Part IV., 83 pp., 1895.

This report forms a part of the volume "Mineral Resources of the United States." It shows by numerous statistical tables the condition of the stone industry of the country in 1894 and compares this with former years. The various kinds of stone considered are included under the heads granite, marble, slate, sandstone, limestone and bluestone. The term granite is used in the broad commercial sense and includes rocks of igneous and crystalline siliceous character. The total value of the stone output in the United States in 1894 was a little more than $37,000,000 being a gain of about $3,500,000 over 1893.

The distribution of the active quarries is shown by states and counties. Many analyses and results of physical tests are recorded, and the present methods of quarrying, dressing and manufacturing the various kinds of stone are given in some detail. It is also shown that indications early in the present year point to 1895 as a period of increased activity in quarrying operations.

The Rocks of the Sierra Nevada. By H. W. TURNER. Fourteenth Ann. Report, U. S. Geol. Survey, pp. 435–495, 12 plates and 3 figs. 1895.

The following sedimentary terranes are recognized: Grizzly formation (Silurian), Calaveras formation (Lower Carboniferous), Robinson formation, chiefly tuffs (Upper Carboniferous), and Juras-Trias beds. All of the above terranes together with the associated igneous rocks were upheaved and folded at the close of the Jurassic. On their upturned edges rests a series of late Cretaceous, Tertiary and Pleistocene sediments and lavas.

The igneous rocks are divided into an older series of Jura-Trias and Palæozoic age comprising diabase and porphyrite, gabbro, norite, peridotite and pyroxenite, granite, quartz-porphyrite, quartz-porphyry and diorite, and a later series comprising rhyolite, andesite and various basalts.

Results of Stream Measurements. By F. H. NEWELL. Fourteenth Ann. Report of the U. S. Geol. Survey, 60 pp. and 2 maps, 1895.

This paper gives the results of operations of the Division of Hydrography up to 1893, showing in concise form the mean monthly, minimum and maximum discharge of rivers in various parts of the United States. Most of the streams measured are in the West, where data of this character have especial value in considering the question of irrigation, and to a less extent that of water power. There are also given facts concerning some of the eastern streams. The most important feature of the paper, however, is to be found in the last part, in a discussion of the depth of run-off for the United States and the relation between mean annual rainfall and mean annual run-off. To illustrate, this small diagrammatic maps of average annual precipitation and run-off are given, and a diagram showing the general relationship between these. This discussion is necessarily general and preliminary to the preparation of more detailed maps which can be made only after observations have been carried on through many years.

Report on the Coosa Coal Field with Sections. By A. M. GIBSON, Assistant Geologist, Pp. 143, 1 plate. Geological Survey of Alabama. Montgomery, 1895.

This report deals with a coal field which, though long known, has not heretofore been adequately brought to public notice. This field is about sixty miles long by five to eight wide containing 345 square miles of productive area. It lies mainly in St. Clair and Shelby counties, the most southeastern division of the Alabama coal field. It lies in a synclinal fold of coal measures between the Cahaba and Coosa (Silurian) valleys. The reports shows that this field contains much undeveloped coal, embracing a large number of minable seams, some of which are of unusual thickness. The coal is generally very good, low in ash and sulphur, hence well adapted for raising steam and forge work. Its coking qualities are specially commended. It is claimed that the well-known fact that the best coking coals in Pennsylvania and West Virginia lie toward the eastern side of this coal field is equally true of Alabama. A comparison of the cokes produced in these three regions seems to prove that this claim is well founded.

At present peculiar economic conditions confine active mining to two points. It is confidently hoped, however, that these conditions will be overcome in the near future, and that extensive developments will result from the information disseminated by this report.

The Structure of Monument Mountain in Great Barrington, Massachusetts. By T. NELSON DALE. Fourteenth Ann. Report of the U. S. Geol. Survey, pp. 557–65.

Following up some studies of the late Professor J. D. Dana, the author shows that this mountain is either of Cambrian age and separated from the Silurian schist mass of Lenox Mountain on the north by a zigzag fault, similar to that described in his other paper as occurring at Dorset Mountain, or else of Lower Silurian age with either a sharp fold or normal fault on its eastern side. The latter view involves a local change in the character of the Silurian sediments.

Since the publication of the paper the author has revisited the locality with Professors C. R. Van Hise and B. K. Emerson who regard the fault theory as the more probable one. The question then arises whether such a transverse fault would not necessitate a longitudinal fault on one or both sides of the mass.

On the Structure of the Ridge between the Taconic and Green Mountain Ranges in Vermont. By T. NELSON DALE. Fourteenth Ann. Report of the U. S. Geol. Survey, 1895.

A topographic and geologic map of four square miles of the ridge, sections, sketches and illustrations of clearage phenomena, "torsional grooving," Pteropod oölite, etc., are given. The ridge is a complex anticline of Lower Cambrian quartzite, etc., overlain by the Cambro-Silurian "Stockbridge Limestone" followed by the Lower Silurian "Berkshire schist," measuring 2000–3200 feet. This anticline is faulted by a double fracture letting down a block several hundred feet wide into the anticline to a depth of 1500 feet and in other places by a reverse fault showing the Cambrian over the Silurian. The fault is twelve to eighteen miles long. In Danby the ridge is crossed by a zigzag E.-W. transverse reverse fault bringing the Cambrian to the level of the Silurian with a vertical displacement of 1450 feet, accounting for a large part of the height of Dorset Mountain.

Notes on the Stratigraphy of the Cambro-Silurian Rocks of Eastern Manitoba. D. B. DOWLING, B.A.Sc. Ottawa Naturalist, Vol. IX., No. 3.

Below the Hudson River shales, the limestones are provisionally divided into a lower and upper Mottled, with a dividing band of fine grained limestone holding cherty nodules. The basal member of the series is a soft sandstone with shaly partings grading downwards to a friable sandstone which may be correlated with the St. Peter's sandstone. The distribution of these divisions is discussed and shown on a sketch map. The thickness of the formation is estimated from exposures on Lake Winnipeg at 580 feet. This is compared with sections obtained from borings within the district.

Tertiary Revolution in the Topography of the Pacific Coast. By J. S. DILLER. U. S. Geol. Survey, 14th Ann. Report, pp. 397–434.

An ancient peneplain is traced about the northern portion of the Sacramento valley and the western slope of the Sierra Nevada. It was once covered with residual material that gave rise to the earlier auriferous gravels.

The topographic revolution consisted in the development out of such lowland conditions of the conspicuous mountain ranges of today. The northern end of the Sierra Nevada was raised at least 4000 feet, and a fault was formed along the eastern escarpment. As the uplift progressed the rejuvenated streams at first accumulated the auriferous gravels and finally, displaced by volcanic flows, cut deep canyons down the western slope of the range.

The Kame-Moraine at Rochester, New York. By H. L. FAIRCHILD. Am. Geologist, Vol. XVI., July 1895.

The "Pinnacle" hills at Rochester, New York, with their complex and puzzling structure, are explained as a frontal moraine, with a preponderance of water-laid drift. The eastern half of the range is a ridge-like series of sand and gravel knolls, with considerable till, the latter partially as a capping. The western half of the range is a typical kame-area. The topography of the whole range is decidedly morainic. With a trend of about 15° south of west the whole range forms part of a curving moraine which beyond the Genesee River swings north of west toward Albion. A critical fact is the discovery of a late system of glacial striæ, over all the vicinity, at right angles to the range, or radial to the arc of the curving moraine. These features are shown by a sketch map.

Certain structural features, as the occurrence of extensive deposits of horizontal fine sands and silts, sometimes occupying the whole breadth of the range, are explained by deposition in the water of the glacal Lake Warren, which is believed to have laved the retreating ice-front throughout western New York.

The paper enumerates other kame-areas in the region, two of which are of much greater bulk and area than the Pinnacle hills.

Essential Properties of Building Stones. By H. FOSTER BAIN. Reprint Monthly Review Iowa Weather and Crop Service, 22 pp., Des Moines, 1895.

This essay presents in convenient form a summary of information on the subject. It is intended for popular distribution so citations to original authorities are omitted. The essential properties of a stone in relation to its use for building purposes are considered to be (1) Strength, (2) Durability, (3) Color, (4) Workability, (5) Availability. The first two topics are treated more fully as being of the greater importance.

Recconnaisance of the Gold Fields of the Southern Appalachians. By GEO. F. BECKER, Ann. Rep. U. S. Geol. Surv. 1894–5. Part III.

This report is based on field work done in 1894, but the work of previous observers in the same area is of course taken into consideration. It also includes a digest of the literature dealing with the gold deposits of Nova Scotia and other northerly auriferous districts, the purpose being to present in a single paper the most noteworthy facts of gold occurrence on the entire eastern side of the continent. The total production of the Southern Appalachians to the end of 1894 was over $45,000,000, which has come chiefly from the Carolinas and Georgia. The deposits are distributed along belts which are parallel to the general trend of the Appalachians. The primary deposits are real veins or secondary impregnations, not beds as has sometimes been maintained, and the ores are similar to those in most gold-bearing regions. They are quartzose masses with very subordinate admixtures of carbonates in which pyrite is always present while chalcopyrite is common and galena, mispickel and zincblende are not rare. The veins commonly follow the schistosity of the pre-Cambrian schists and include fragments of the wall rock. The impregnations occur chiefly in Algonkian fragmental volcanics similar to those of the South Mountain of Pennsylvania. The deposition of ore is associated with intrusions believed to belong to the same Algonkian epoch, but it is more recent than the mountain building era during which the schistose structure was developed. The veins were opened by normal faulting and no indications of the replacement of wall rock by quartz were detected. The term "stringer lead" is proposed for a group of small auriferous veinlets such as usually constitutes the basis of economical operations in the South and is very common in California and Australia. The impregnations, that of the Haile mine for example, are similar to the Norwegian Fahlbands. The ores of the Maritime Provinces appear to be of the same age as those of the South and to resemble them closely. The placers of the southern Appalachians are in part stream gravels and in part consist of quartz-bearing rock, which is in place but entirely decomposed. The term "saprolite" is used to denote such untransported but thoroughly rotten rock. In the South the saprolite forms a blanket which is generally from 30 to 100 feet in thickness. About half of the report deals with the deposits systematically and the remainder consists of descriptive notes on the different areas.